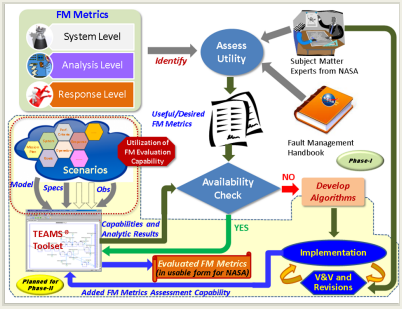
Small Business Innovation Research/Small Business Tech Transfer

Fault Management Technologies - Metrics Evaluation and V&V, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

Functional robustness, resulting from superior engineering design, along with appropriate and timely mitigating actions, is a key enabler for satisfying complex mission goals, and for enhancing mission success probability. Fault Management (FM) is a crucial mechanism to ensure system functionality from system design through the operational phase of a mission. FM is implemented with spacecraft hardware, on-board autonomous software that controls hardware, software and information redundancy, ground-based software and procedures. Given that most NASA missions require highly complex systems, at least a basic level of fault detection and isolation capability is almost always added on to them to protect against thousands of potential failure modes. It is therefore imperative to treat FM like any other engineering discipline and formalize the tools, metrics and best practices to ensure a uniformly high quality of implementation of FM across all NASA missions. The proposal to utilize recent advances in the theory and practice of FM, and in particular in the theory and practice of FM metrics, to enhance the ability of system and FM engineers and operators to measure and document the value, cost and risks associated with the FM design. This SBIR is aims to utilize existing capabilities of TEAMS toolset and extending it as necessary to enable it to compute a range of FM metrics, quantitative assessment of an FM design and V&V of the FM activities. As schedule and resource pressures build, there comes a need to reduce the amount of planned testing while guaranteeing a degree of confidence in FM design. By defining a methodical approach to identifying and assigning priorities to tests, one can define a minimum set of tests required to certify FM (i.e., incompressible test list). This SBIR also seeks to develop a Prioritized Validation Test Suite that ensures that critical risks are detected and appropriate FM Mitigation Strategies are employed to minimize the risk.



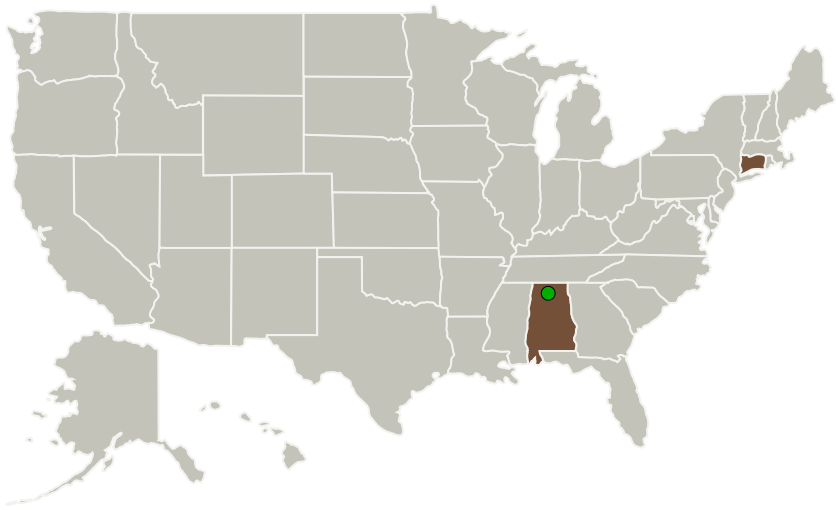
Fault Management Technologies - Metrics Evaluation and V&V, Phase II

Table of Contents

Fault Management Technologies - Metrics Evaluation and V&V, Phase II

Completed Technology Project (2016 - 2018)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Qualtech Systems, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Connecticut

Project Transitions

April 2016: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Qualtech Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sudipto Ghoshal

Co-Investigator:

Sudipto Ghoshal

Fault Management Technologies - Metrics Evaluation and V&V, Phase II

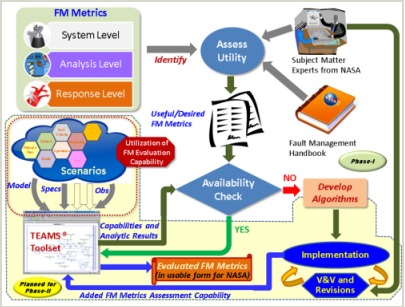
Completed Technology Project (2016 - 2018)

July 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139535)*

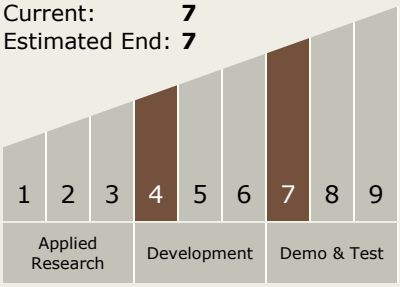
Images



Briefing Chart Image
Fault Management Technologies - Metrics Evaluation and V&V, Phase II
(https://techport.nasa.gov/image/132001)

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.4 Information Processing
    - TX11.4.1 Science, Engineering, and Mission Data Lifecycle

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System